Mapping Australia's undiscovered biodiversity has big economic benefits

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A new report by Deloitte Access Economics has found every $1 invested

in discovering all remaining Australian species will bring up to $35 of economic benefits to the nation.

The cost-benefit analysis of the value of discovering new species has never before been attempted in Australia. It comes as scientists launch a new mission to discover and document all Australian species that remain undiscovered and unnamed within a generation.

The 25-year mission being launched today is led by the Australian Academy of Science's Director of Taxonomy Australia, Adjunct Associate Professor Kevin Thiele.

He says many Australians would likely be quite surprised to know that after more than 300 years of Western scientific exploration of Australia's rich biodiversity, only 30% of Australia's estimated 750,000 species have been named and documented so far.

"Without this mission, it's likely to take more than 400 years to discover all remaining Australian plants, animals, fungi and other organisms. A 16-fold increase in the annual rate of discovery is required over the next 25 years to meet this ambitious goal.

"Combining the skills of our current and future scientists with new technologies such as genome sequencing, artificial intelligence, and supercomputing makes this ambitious goal achievable by 2050.

"The successful completion of this mission will help build a path to a sustainable and prosperous future and place Australia among the first nations in the world to benefit from a fully documented biodiversity.

The mission is also expected to:

- reduce green tape by providing more certainty to the resources

sector;
- help protect Australia's agriculture and the environment from imported pests and diseases by reducing biosecurity risks;
- stimulate new opportunities in agriculture, fisheries and aquaculture, pharmaceuticals and environmental management;
- help ensure that conservation investments are targeted and effective; and
- lead to new industries in emerging fields such as industrial food technologies and bioengineering.

The estimated cost of building capability needed to document the remaining estimated 600,000 Australian species yet discovered in a generation is $824 million over 25 years.

The mission's initial focus will be to develop assets, including a national biobank and DNA sequence library, to ensure DNA sequences are available for all known Australian species. This would unlock enormous potential, from eDNA sequencing for environmental monitoring to bioprospecting, bioindustries and bioengineering.

Adjunct Associate Professor Thiele says the collection of more than 70 million scientific specimens in museums and herbaria in every Australian state and territory represents a $7 billion national science infrastructure and a solid foundation on which to build such a national biobank.

Insect expert Dr. Erinn Fagan-Jeffries from The University of Adelaide is one of the Australian scientists involved in Taxonomy Australia's new mission. Dr. Fagan-Jeffries is researching the biodiversity and taxonomy of parasitoid wasps in Australia. She recently discovered and named four new species of wasp in collaboration with primary schools in regional South Australia.

Deloitte Access Economics partner and principle report author, Matt Judkins, says the modelling and analysis indicate that Taxonomy Australia's mission is both ambitious and has strong potential to create significant economic and social benefits for the country.

"Benefits in the sectors of biosecurity, biodiscovery, agricultural R&D and biodiversity conservation attributable to accelerated taxonomic discovery range from $3.7 billion to $28.9 billion over a 25-year period to 2045, depending on the low, medium or high scenario cases defined for each benefit stream. This compares to the costs of investment in seven key categories estimated at $824 million over the same period.

"While a significant investment, and a lot of good will, will be required, Australia will have access to a much better understanding of its biodiversity and the risks it faces."

Background information—What is taxonomy?

Taxonomy is the science of classifying living organisms and arranging them into groups to understand relationships between species. Taxonomists discover, discern, describe, name, classify, study, compare and identify the world's living and extinct species and other taxa. Their core task is to document the living world.

The discipline provides the foundational 'map' of biodiversity: taxonomic names and classifications are the key framework around which global knowledge and understanding of biodiversity can be organised and accessed.

Francesco Martoni, an early career Entomology Research Scientist working for Agriculture Victoria, says, "From an entomological point of view, discovering and describing new insect species is of paramount importance not only for a better understanding of Australian biodiversity

but also to protect its agriculture and biosecurity.

"Indeed, undescribed species may risk triggering expensive biosecurity responses if mistakenly identified as similar-looking pests. On the other hand, insect pest species may hide in plain sight, because too similar to harmless endemic groups and therefore hard to be targeted by pest management operations. This is due to the fact that describing and naming a species is the first step to further study its biology, in fact we often lack ecological and behavioural information on a species that has not been described.

"Discovering a new species can provide the tools for its identification and enable to understand how to protect it, if a threatened endemic species, or how to fight it, if a newly emerged pest. Ultimately, described species bear a name that can be used by policymakers to determine the real biosecurity risk associated with a species, distinguishing it from closely related, harmless, native groups that need our protection."

Dr. Leanda, a Higher Education Academy Fellow and IUCN Young Fellow at Curtin University, says, "Many thousands of Australian species are estimated to have gone extinct in the last few hundred years, without ever being formally recorded. Recent history has seen an increasing dependence on metrics such as GDP and population growth as measures of success in a global context, often with reckless abandonment for natural environments and species.

"The economic benefit of natural environments and species is very difficult to measure because monetary value cannot be directly given and thus undervalued. Instead, value is measured ethically, morally or intrinsically such as with known benefits to disease control, mental health, climate and ecosystem stability. However, these indirect benefits are undervalued when the feasibility of economically driven projects are

deliberated. Indeed, permanent costs to our natural environment and native species through land clearance are perceived as unfortunate, but necessary losses for economic productivity.

"Ideally, providing a detailed account of how the discovery of new species may provide economic benefit may slow and eventually stop unsustainable developments that lead to species extinctions. However, it may be some time before traditional metrics of societal success become replaced with those that align with sustainable and equitable development. Until then, providing a tangible estimate to our economy will reflect at least a small proportion of the immense intrinsic worth of species discovery."

More information: Jane Melville et al, A return-on-investment approach for prioritization of rigorous taxonomic research needed to inform responses to the biodiversity crisis, *PLOS Biology* (2021). DOI: 10.1371/journal.pbio.3001210

Cost benefit analysis of a mission to discover and document Australia's species: www2.deloitte.com/content/dam/ … s-mission-060521.pdf

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